

EFFECT OF LOW SALT CONTENT ON THE QUALITY OF PAINHO DE PORTALEGRE, A TRADITIONAL PORTUGUESE SAUSAGE – PHYSICAL, CHEMICAL AND MICROBIOLOGICAL ASPECTS

M. Elias*, A.C. Agulheiro-Santos and P. Nunes

Universidade de Évora, Instituto de Ciências Agrárias Mediterrânicas, Apartado 94, 7002-554 Évora, Portugal Email: elias@uevora.pt

Keywords: Portuguese sausage, low salt, microbiology, physical and chemical aspects

Introduction

The role of salt in cured sausage production is well known: aw depressor, and consequently its bacteriostatic action, as a taste enhancer, it decreases the isoelectric point of proteins and, consequently, decreases the drip loss. However, salt in excess plays an undesirable role in human health, as it contributes to an increase in heart disease. The salt content in traditional Portuguese sausages is typically 5-6%. Nowadays NaCl levels below 3% are recommended. The main objective of this work was to evaluate the influence of decreasing salt content in the production of one type of Portuguese traditional sausage, on the microbiological, physical and chemical characteristics of this product.

Materials and Methods

“Painho de Portalegre” is a traditional Portuguese sausage (length: ± 30 cm; diameter: 4-5 cm; curing period: 40 days; ingredients: meat, fat, salt (NaCl), garlic and fermented *Capsicum annuum* L.) made with meat and fat from the Alentejano pig breed, a Portuguese breed. Sausages were produced with 3% and 4.5% of NaCl after their curing period. Five samples were taken from each group. Physical and chemical analyses were carried out: pH, a_w , %NaCl, chromatic coordinates L*, a* and b*. Microbiological analyses carried out were: total mesophilic aerobic bacteria, yeasts, *Micrococcaceae*, Lactic acid bacteria, *Enterobacteriaceae*, *Enterococcus*, coliforms and *E. coli*. For statistical treatment of the data, an ANOVA was performed, using Statistica 5.1 program, and means were compared using the HSD Tukey method.

Results and Discussion

Physical and chemical analyses (Table 1) showed lower pH values in the sausages with 4.5% NaCl, this maybe due to the decrease in pH often found with this salt. As expected, a_w values were lower in products with more salt. The analyses of %NaCl confirm the concentration of this salt in the final product. Higher a* values in sausages with 4.5% of NaCl probably result from the higher *Micrococcaceae* counts with nitrate reducing action (Barriere *et al.*, 1998) (Table 2).

Table 1: Physical and chemical characteristics of “Painho de Portalegre” with 3% and 4,5% NaCl – means and standard deviation.

NaCl	pH	a_w	%NaCl	L*	a*	b*
3%	6,04 a	0,88 a	3,14 a	45,8 a	11,8 a	14,1
	$\pm 0,03$	$\pm 0,01$	$\pm 0,06$	$\pm 0,4$	$\pm 0,2$	$\pm 0,3$
4,5%	5,90 b	0,84 b	4,54 b	43,0 b	12,9 b	14,5
	$\pm 0,03$	$\pm 0,00$	$\pm 0,11$	$\pm 0,6$	$\pm 0,5$	$\pm 0,2$

Different letters in the same column represent significantly different means.

Concerning microbiological analyses (Tables 2 and 3), mesophilic, yeasts and *Micrococcaceae* counts show significantly higher values in sausages with 4.5% NaCl. This reveals a good adaptation of those microorganisms to those salt concentrations in the substrate studied. The main microorganisms found at high levels in “Painho de Portalegre” were lactic acid bacteria, with more than 8 log values. Results of microorganisms related with hygiene shows that sausages with lower salt content (3%) exhibit similar values to those with higher salt content.

Table 2: Microbiological analyses of "Painho de Portalegre" (mesophylic aerobic bacteria, yeasts, *Micrococcaceae* and Lactic acid bacteria) with 3% and 4,5% of NaCl – means and standard deviation.

NaCl	Mesophylic (log ufc/g)	Yeasts (log ufc/g)	<i>Micrococcaceae</i> (log ufc/g)	Lactic acid bacteria (log ufc/g)
3%	7,24 a ±0,31	2,85 a ±0,15	3,15 a ±0,12	8,44 a ±0,03
4,5%	7,96 b ±0,03	3,95 b ±0,02	4,25 b ±0,08	8,33 b ±0,01

Different letters in the same column represent significantly different means.

Table 3: Microbiological analyses of "Painho de Portalegre" (*Enterobacteriaceae*, *Enterococci*, coliforms and *E. coli*) with 3% and 4,5% of NaCl – means and standard deviation.

NaCl	<i>Enterobacteriaceae</i> (log ufc/g)	<i>Enterococci</i> (log ufc/g)	Coliforms *	<i>E. coli</i> *
3%	2,97 ±0,49	5,65 ±0,16	4,50 ±0,50	3,50 ±0,50
4,5%	2,77 ±0,07	5,41 ±0,15	4,00 ±0,00	3,50 ±0,50

Different letters in the same column represent significantly different means.

* Results in classes: class 1 (< 1 bacteria/g); class 2 (≥ 1; < 10); class 3 (≥ 10; < 100); class 4 (≥ 100; < 1 000); class 5 (≥ 1 000; < 10 000).

Conclusions

Based on the results obtained for physical, chemical and microbiological analyses, it was possible to produce "Painho de Portalegre" with low salt content (3% in the end product) without quality loss.

Acknowledgements

This research work was supported by the IFADAP under Project AGRO 218.

References

- Barriere, J-C., Bacque, E., Puchalt, G., Quenet, Y., Molherat, C., Cassayre, J and Paris, J-M. (1998). Reactivity of l-(des-3-hydroxy-picolinoyl) pristinamycin I_A. *Tetrahedron* 54 (42): 35-40.
- Berriain, M.J., Peña, M.P. and Bello, J. (1993). A study of the chemical components which characterize Spanish saucisson. *Food Chemistry*, 48: 31-37.
- Gimeno, O., Astiasarán, I. and Bello, J. (2001). Influence of partial replacement of NaCl with KCl and CaCl₂ on microbiological evolution of dry fermented sausages. *Food Microbiology*, 18: 329-334.